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ABSTRACT

A course of study was researched, designed, and implemented by the writer to learn mathematics apprehensions of fifth grade students. The primary goal was to reduce mathematics apprehension through positive mathematics experiences at home as well as in school. The objectives of the program were to develop a more positive feeling about mathematics by finding success in completing daily assignments and increasing proficiency in mathematics, and to foster a positive feeling about mathematics in general. The writer discussed positive mathematics feedback and modeling of problems with the parents of the participants, set up a mathematics activity and problem solving center, and encouraged students to ask questions while giving them positive feedback and encouragement. Appendices include: (1) "Math Inventory"; (2) "Attitude Survey"; (3) "Math Test Pre/Post"; (4) "Positive Phrasing/Parent Handout"; (5) "Assignments Tally Sheet"; (6) "Questions Asked Tally Sheet"; (7) "Weekly Log"; and (8) "Math Apprehension Survey." Seventeen references are listed. (Author/DC)

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by

Marjorie Donato

Cluster XXIX

A Practicum I Report presented to the
Ed.D. Program in Early and Middle Childhood
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

NOVA UNIVERSITY

1989

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PRACTICUM APPROVAL SHEET

This practicum took place as described.

Verifier: Dalne M. Dola
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This practicum report was submitted by Marjorie J. Donato under the direction of the advisor listed below. It was submitted to the Ed.D. Program in Early and Middle Childhood and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova University.

Approved:

May 24, 1989
Date of Final Approval of Report

Walter Schurman
Walter Schurman, Ed.D., Advisor

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ABSTRACT

Positive Experiences to Lessen Mathematics Apprehension in Fifth Grade Students. Donato, Marjorie J., 1989: Practicum Report, Nova University, Ed.D. Program in Early and Middle Childhood.
Descriptors: Elementary Education/Elementary School Mathematics/Learning Activities/Mathematics Achievement/Mathematics Instruction/Problem Solving/Student Attitudes/Teaching Methods/Word Problems

A course of study was researched, designed, and implemented by the writer to lessen mathematics apprehension in fifth grade students. The primary goal was to reduce mathematics apprehension through positive mathematics experiences at home as well as in school. The objectives of the program were to develop a more positive feeling about mathematics by finding success in completing daily assignments and increasing questions asked during mathematics instruction, to increase proficiency in mathematics, and foster a positive feeling about mathematics in general.

The writer discussed positive mathematics and modeling of problems with the parents of the participants, set up a mathematics activity center, set up a problem solving center, and encouraged students to ask questions while giving them positive feedback and encouragement.

The result of the program was a more self-confident target group of math students. Students were finishing their math assignments by the fifth week of the program, they were asking at least 33% to 400% more questions per week, there was a lessening of math apprehension by 22% to 60%, students improved 20% to 60% in their math proficiency, and they demonstrated a 20% to 80% improvement in their feeling about math and math class by the end of the program. Other fifth grade mathematics teachers requested information in order to implement the Math Enhancement Program for their mathematics students.

CHAPTER I

INTRODUCTION

Description of Work Setting and Community

The writer's community was originally a small southern fishing village that within its 110 years of existence had grown to a semirural city with shopping centers, large subdivisions, and a regional hospital. The population in this formerly small community had grown to over 25 thousand residents and continued to grow and change each and every day. The population was a mixture of retired citizens, families with children, and transients who moved to the writer's area since the weather remained mild all year.

The school system was the largest employer in the county. It employed approximately 1,900 teachers and more than 2,000 support personnel. The county public schools had an enrollment of approximately 30,000 students in grades kindergarten through twelfth. There were 37 schools with three in the planning stage for the next two years. The county had 22 elementary schools, 6 middle schools, 1 vocational school, 6 high schools, 2 adult education centers, and an Energy

Management Center to enhance the science curriculum. The school board consisted of five elected board members who served for a period of four years as the policy making overseers of the county school system (Report of the Superintendent and School Board, 1988).

The instructional program was comprehensive and uniform for all students enrolled in grades kindergarten through twelfth. The teachers structured their own curriculum within guidelines that were set by the school district and in conjunction with the local administration. The curriculum was further refined within the classroom as determined by the student's developmental level, individual needs, and particular learning style (School Five Year Study for --- Association of Schools and Colleges, 1987-88).

The district curriculum guidelines were adhered to by all school employees. The philosophy and objectives of the district were woven into all curriculum areas.

Writer's Work Setting and Role

The writer's school was 20 years old and serviced 721 students. The school was located in a low to middle economic area. The school population was somewhat transient with 42% of the sixth graders enrolled for five years or more. One-third of the students were on free or reduced lunch and 40% of the

students lived with both natural parents, thereby reflecting the national trend of single parent families and extended families.

The teachers and staff were helpful to each other and cared deeply about providing a sound education for the students they taught and came in contact with. On a recent survey the teachers stated that they were satisfied or somewhat satisfied with the school and programs at the school. A majority of the teachers at the school had spent an average of a decade teaching at the school site. The teachers at the writer's school had spent an average of 16 years teaching. The teachers had helped to developed the philosophy of the school. The school philosophy stated that:

> We, the faculty of --- Elementary School, believe that education is synonymous with growth. All living organisms are equipped with a built-in pattern for growth; yet, within this basic pattern, each individual is different from all others.
>
> Growth is physical, mental, social, emotional, and intellectual. Education must encompass all aspects of growth to develop within the child the possibility of living a full and enriched life as a contributing member of our changing society.
>
> We recognize each student as an individual of worth, dignity, and respect. Therefore, the

learning environment must be diverse, flexible, comfortable, and appropriate for all.

Only through a common purpose shared by the community and the school, can we hope to fulfill the educational needs of every child in our school. (School Five Year Self Study for --- Association of Schools and Colleges, 1987-88, p. 17).

The writer became a fifth grade teacher at the school under study in 1984. The writer's responsibilities included the following:

To sequence instruction on the basis of each child's level of achievement and individual potential.

To structure class activities capitalizing on the similarities of students.

To guide each child to self-realization and optimum potential.

To help the child develop into a mature person.

To afford opportunities for students to learn to act in a socially acceptable manner.

To provide students with occasions to develop and use the processes of problem solving, critical thinking, and decision making.

To create a learning atmosphere that

encourages freedom of expression, creativity, self-discipline, motivation, and the acceptance of responsibility.

To evoke an awareness of the richness of our cultural heritage as well as living in a free nation.

To continually improve communication between the school and community and to encourage more parental and community involvement.

To instill an appreciation of our natural environment as a whole.

To focus vision beyond just our own country and citizens, to include with caring and compassion, all peoples in all lands of the world. (School Five Year Self Study for --- Association of Schools and Colleges, 1987-88, p. 17).

The writer had the following specific responsibilities for the 1988-1989 school year:

To educate 32 fifth grade students.

To follow the county curriculum.

To pace the students according to county guidelines.

To employ a variety of teaching techniques.

To uphold and enforce school rules according to Board policy.

To establish and maintain open lines of

communication with students, parents and other professionals.

To continue to grow professionally through programs offered in the county and institutions of higher learning.

To follow the county and school stated objectives. (Basic Educational Programs in --- County, 1988-1989, p. 3).

The writer's school followed the curriculum and guidelines set up by the school district and provided the students with the best educational experiences possible.

CHAPTER II

STUDY OF THE PROBLEM

Problem Description

Many fifth grade students in the writer's math class had difficulty with mathematics skills and story problems. The students who had difficulty with mathematics appeared to become worried and anxious when they were assigned math work to complete in class with the help of the writer or as an assignment to do outside of class. Students who had difficulty performing math and appeared worried avoided completing math assignments. When students did not have assignments completed they usually stated a variety of reasons and when questioned more deeply, they admitted that they did not enjoy math and stated that they felt math was just too difficult for them and they had never been able to do math. These otherwise very capable students gave up when it came to math.

When students were told that they were going to have a math test, many of them became visible upset by having worried or almost scared expressions on their

faces. Many times students asked for an extension of time before having to take a math test by saying that they needed more time to study even though very little studying of math ever seemed to go on.

The students who had little or no success in math class appeared to become visibly nervous when randomly called on to answer questions posed in math class. The same students that became nervous when called on, never asked questions even though they may not have understood the material being taught.

When students did not complete math assignments they did not attend school or became suddenly ill prior to math class and went to the nurse's office instead of attending math class. Students who admitted that they stayed home when assignments were not completed or got a pass to the nurse's office to go home became visibly upset even when they watched the writer demonstrate new math work on the board.

The math text only included three or four word problems placed at or near the end of assignments and only one assignment per chapter was devoted to word problems. The problems were written to be challenging problems and were so difficult that students who might have tried them were just turned off since only a handful of students were successful with them unless they were taken through them step by step. The

students had learned to distrust and dislike word problems over the school years. Many students told the writer that their former teachers had just skipped over the word problems since most students could not do them anyway.

Many of the parents of the students in the writer's fifth grade math class had stated that their children were not very good at doing math and had never been able to do math. The same parents who had stated that their children were not very good at math admitted that when they were in school, they had difficulty with math, too. The parents who stated that they too had difficulty with math had very low expectations for their children and seemed to feel that there was nothing that anyone could do to help their child learn and use math more effectively.

The general problem was that many fifth grade students had difficulty with math skills and word problems and many of these same students showed signs of math anxiety.

Problem Documentation

Many students in the writer's math class had difficulty with math skills and word problems. According to a math inventory (see Appendix A) given the first day of class, 50% of the writer's students

demonstrated less than 60% mastery of math skills and word problems (see Figure 1).

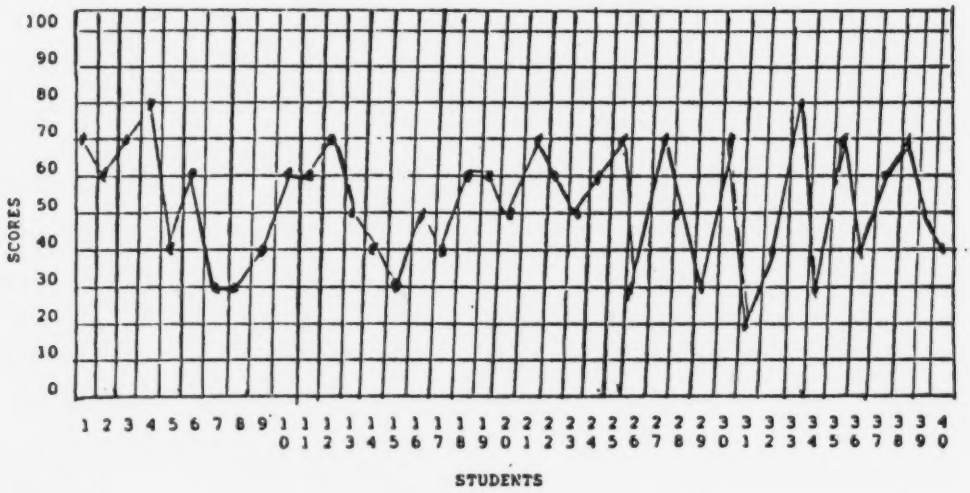

Figure 1. Mathematics Inventory - Fifth Grade

The writer informally interviewed 10 students to see why they had not finished assigned work. Eight of the students stated that neither they nor their parents could do math. The eight students said that their previous teachers instructed them to use calculators since they had such a difficult time with math and might never learn the math facts that were needed to solve problems.

The writer observed negative body language in 15 of the fifth grade math class as they entered math class for the first class of the 1988/1989 school year. The 15 students did not ask questions when they did

not understand the math presented every time math class met and made negative remarks about math when they were unable to solve problems assigned to them.

An informal survey (see Appendix B) was given the first week of school. The students were asked to choose the school subject they liked the most from math, reading, spelling, social studies, or science. Of the 40 students in the writer's class only 16 said that they liked math the best when they chose from the list of subjects (see Figure 2). The survey also

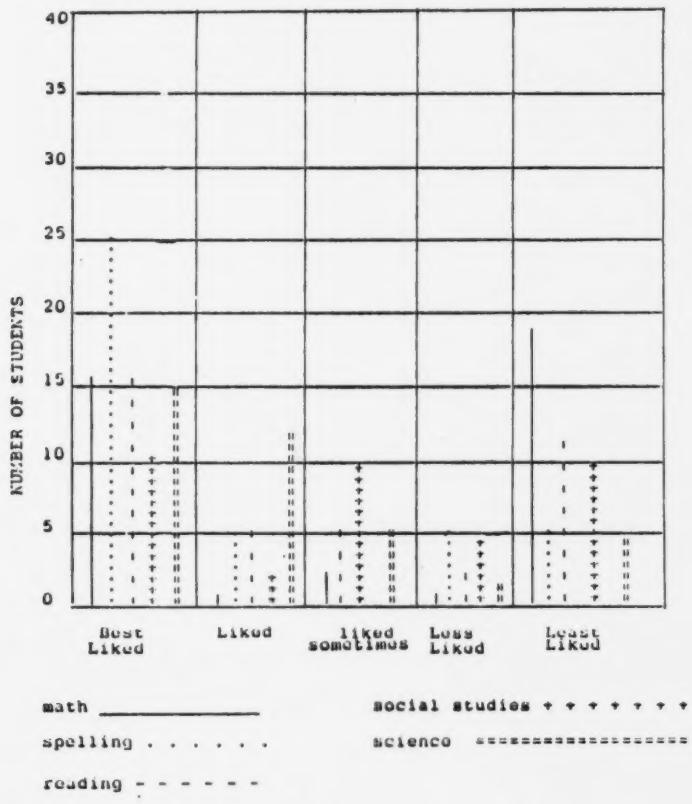

Figure 2. Attitude Survey Figures

showed that 19 of the students had placed math at the bottom of the list being the least liked school subject.

The observations, survey, and inventory all indicated a need to help students to enjoy math and master the skills to solve fifth grade problems.

Causative Analysis

The math text used in the writer's fifth grade math class moved quickly from one skill to another with little time to internalize concepts before the teacher had to rush on. There was very little word problem practice in the text and it was located at the end of the assignments and as a lesson at the end of each chapter. The word problem book to supplement the text was very difficult for the average or below average students to understand and complete math work successfully. Since math is cumulative (Lazarus, 1974), students who were moved too quickly in previous classes came to the writer's fifth grade with many deficit areas. Many of the students who were unable to work math problems may not have really mastered previous math skills but only memorized what was needed to do the math (Lazarus).

Many fifth grade students in the writer's math class did not even try to complete math assignments

since the idea that they could only do math by using a calculator had been placed in their minds. Many of the students who asked to use a calculator to do math did not have a positive feeling about their ability in math and seemed to have had some very negative feedback in past math classes. Good (1981) stated that negative words or negative body language by teachers and parents may very well cause students to develop a dislike for the subject being taught.

Many students had not been encouraged to ask questions in previous math classes but were instructed to just watch and listen to what was being presented until they understood what was being taught. Many students who were not actively involved in their learning had a difficult time mastering concepts according to Dunn and Dunn (1978).

Students did not realize that math would be a large part of their lives in the future. Students who did not discuss subject areas with their peers and felt that subjects were only school related and worked individually without any peer interactions were at a disadvantage since they did not relate subjects to their own lives, truly master concepts, and discover how enjoyable learning in a shared setting could be according to Slavin (1981).

Lazarus (1974) stated that a significant cause of

the problem may have been created by parents reacting to math in a negative manner either by saying negative things about math or showing negative body language which students accepted and internalized as their own feelings and eventually developed their own dislike for math. Bulmahn and Young (1982) stated that teachers may also have had a dislike for math or a specific area of math and without realizing it transfered their dislike for math to their students.

The math text did not address all the needs of the students, and parents and teachers did not always demonstrate positive skills where math was concerned.

Relationship of the Problem to the Literature

Others had written about the problem of students who had difficulty with mastering math skills and solving story problems and had shown signs of becoming anxious when doing math.

The relationship between the verbal behavior of teachers and negative student achievement had been shown to have had validity according to Good (1981). When students were reinforced with negative words or body language students were more likely to develop negative feelings for the subjects that they were being taught according to Good.

Cooper (1979) found that when students were exposed

to negative expectations by those important to them, such as teachers or parents, it may have caused them to be unable to master materials presented and it also may have caused them to develop a poor attitude toward the subject that was being taught.

Tobias and Weissbrod (1980) stated that students who did not get positive feedback when they asked or answered questions while learning a subject would eventually stop asking or answering questions. Negative feedback by the instructor would develop a negative attitude in the students according to Tobias and Weissbrod.

Hawkins (1987), Johnson (1987) and Slavin (1981) stated that students who were passive participants as opposed to active participants in their learning were usually less successful at mastering material that must be internalized for future application. When students were asked to only respond to closed ended questions they developed a very narrow vision of math problems and only looked for the one solution to solve a problem and did not realize the creativity that was involved in the solution of math problems according to Schoenfeld (1985).

Slavin (1981) stated that when students worked independently of the other students in the classroom they felt isolated and frustrated at not being able to

learn materials presented. When students were placed in a classroom setting that was not competitive, students developed positive attitudes about subjects taught and reacted positively to the group activities while achievement level improved according to Slavin.

Dunn and Dunn (1978) stated that when students were not taught according to their preferred learning channel they were at a disadvantage and had been less successful with learning materials presented. Hodges (1983) agreed with Dunn and Dunn when he stated that students who had difficulty learning in the visual or auditory modalities needed to be taught in an alternate method so that they could enjoy the subject that was taught and avoided becoming anxious when having to do school work that was difficult for them to learn.

Fennell and Ammon (1985) stated that when students were presented with word problems to be solved from the text and were not involved in the creative process of developing and writing their own word problems, students did not truly internalize the way that math word problems effected their daily lives. Graves (1978) stated that unless students learned word problems from the point of writing them, they might very well have difficulty in solving word problems successfully.

Negative feedback along with inappropriate

teaching practices appeared to have been at the root of the problem of students developing poor math skills, poor problem solving skills, and a feeling of being anxious when doing math work.

CHAPTER III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

Goals and Expectations

The writer's goal in this practicum was to reduce mathematics apprehension of students through positive mathematics experiences. Positive feedback was used to encourage students to utilize their existing math knowledge to write, solve, and discuss math problems with their teacher, parents, and peers. The county curriculum was followed and augmented by the writer's program.

Behavioral Objectives

The following objectives were projected for the three-month practicum implementation:

1. Each of the students will complete daily assignments every day by the end of the program as determined by a weekly tally of work completed by the students in the program.

2. Each student will increase the number of questions asked in math class by the end of the program by 10%. Teacher observations will be used to tally how many questions are asked each day by the students in the study (see Appendix F).
3. A lessening of mathematics apprehension will be demonstrated by a 20% improvement in 9 out of the 10 students in the program as measured by a pre and post Math Apprehension Survey (see Appendix H). The numerical values of 1 for never, 2 for sometimes, and 3 for always will produce scores for each student.
4. When given a pre and post Math Test (see Appendix C) containing skills and problem solving, each student will demonstrate improvement in proficiency by at least 10%.
5. When given a pre and post Attitude Survey (see Appendix B) having to do with feelings about math, each student will demonstrate a positive improvement in feelings about math class by 20%.

Measurement of Objectives

Objectives must be evaluated throughout any program in order to determine the program's success or

failure. The objectives were measured by the following for evaluation purposes:

1. In order to measure the number of problems completed weekly a daily tally was kept of how many problems were assigned and how many problems were completed. The number of problems assigned was then compared to the number of problems completed. Each of the students would complete daily assignments every day by the end of the program. Students kept track of their own problems completed so that they could be more aware of their individual progress. Completing assignments given was an integral part of the practicum since math is cumulative (Lazarus, 1974). Therefore when students stay current with material being taught they become more comfortable with math since the concepts have been practiced many times.
2. In order to measure the number of questions asked regarding math by students in the program a weekly tally was kept by the teacher and the results were shared with the students (see Appendix F). An increase of 10% in the number of questions asked by each

student by the end of the program was used to indicate that the objective was met. Students were encouraged to ask questions so that the teacher could clarify misunderstandings and reevaluate teaching strategies where weaknesses occurred. Positive verbal skills were used so that the students were more willing to ask questions without fear of letting the teacher or other students become aware of their lack of understanding of a math concept. According to Tobias and Weissbrod (1980) positive feedback to questions asked will cause students to continue asking questions and therefore concepts become mastered and math apprehension could be reduced.

3. In order to measure a lessening of math apprehension a pre and post Math Apprehension Survey (see Appendix H) was developed. The numerical values of 1 for never, 2 for sometimes, and 3 for always produced scores for each student. The survey was designed to measure attitude changes after implementation of the practicum. A 20% improvement in 9 out of the 10 students in the program measured by the pre and post Apprehension Survey (see

Appendix H) demonstrated a lessening of mathematics apprehension.

4. In order to measure any increase in the proficiency of math skills and problem solving the students who were in the program were given a pre and post Math Test (see Appendix C). An improvement of 10% in proficiency was used to demonstrate positive growth. The Math Test was based on the county curriculum for fifth grade students.
5. In order to measure whether or not students involved in the practicum developed more positive feelings about mathematics and math class a pre and post Attitude Survey (see Appendix B) was developed. Students were asked to indicate subjects best liked to least liked. A 20% improvement in feelings about math class as demonstrated by each student demonstrated a positive improvement in feelings about math. Cooper (1979) indicates that when students are exposed to positive expectations by those important to them, they develop a more positive attitude about material being taught, are more capable of mastering material being presented and enjoy the subject area.

6. A weekly log was used to record any unexpected events (see Appendix G). A weekly log was an integral part of this practicum since many positive as well as negative events occur during any practicum implementation.

CHAPTER IV

SOLUTION STRATEGY

Discussion and Evaluation of Solutions

Many fifth grade math students attending the writer's math class demonstrated a need for a change in the existing math program. The negative body language observed by the writer when math was mentioned, the lack of assignments being completed, the poor performance on a math inventory given to the students the first week of class during the 1988/1989 school year (see Appendix A) along with an informal attitude survey (see Appendix B) showing math was not a preferred subject highlighted the need for a change in the current fifth grade math program.

After the writer reviewed the literature a variety of possible solutions to the problem were considered to be viable to solve the problem.

Hodges (1983) discussed addressing individual learning styles so that students could work in their preferred learning style and master materials presented while gaining positive attitudes about the

subject at the same time. Since there is a diversity in the way that students learn, all learning styles should be considered when planning lessons. Students learn through the visual, auditory, kinesthetic, and tactual modalities according to Dunn and Dunn (1978). Many students have not been physically involved in math since first or second grade and it may be time to turn the clock back for the fifth grade math students and leave the paper and pencil assignments to use a game in order to internalize math concepts and enjoy learning math at the same time.

Students need to learn in a positive setting with the encouragement of teachers and parents letting them know that they are expected to do their best. Cooper (1979) states that when positive approaches are used with students they will have more success learning materials presented to them. Good (1981) states that when students are expected to achieve they are more apt to achieve. Students need to know that their teachers and parents have complete confidence in their ability to learn and do math while using positive phrasing to encourage them on to excellence.

Many students are unaware of the components of math problems until they actually get into the problem from the other side and write them according to Fennell and Ammon (1985). Students may also actually enjoy

writing and sharing their own word problems and develop a heightened interest in math.

Modeling of math problems by teachers and parents may help students develop a less anxious feeling when the have word problem presented to them in math class according to Tobias and Weissbrod (1980). Most students never see teachers and parents work math problems with all of the false starts, corrected mistakes, and re-thinking about solutions selected (Schoenfeld, 1985). Modeling may very well encourage hesitant math students according to Tobias and Weissbrod.

A variety of approaches must always be used to strengthen any program of instruction due to the diversity of students. Addressing individual learning styles, fostering positive attitudes, creating and sharing math problems along with the modeling of math problems by parents as well as teachers may very well be the key to helping students develop a positive attitude toward math and work problems successfully.

Description of Selected Solution

The writer's selected solutions were additions to the existing county math program. The solutions did not act as replacements to the current math text but

augmented and enriched the math experience for the students selected for this study.

Fifth grade math students usually only make use of their auditory and visual senses while learning math and seldom use their kinesthetic or tactual senses. While listening to the teacher explain a math process and watching the board to see the steps to follow to solve a problem are important ways to learn, many students internalize math better and develop an interest in math by actually touching or doing through games and learning centers according to Dunn and Dunn (1978). The use of games and learning centers keyed to the math curriculum were used to enhance the existing math program and to make the learning of math more exciting and less stressful.

The writer created a positive learning experience in which the students were encouraged to ask questions and give answers in a secure setting. When students were incorrect in a response they were encouraged to find the correct answer and to always try again. According to Cooper (1979) a positive setting and positive feedback, in the form of positive phrases, will cause students to work more diligently to learn materials to be mastered. Parents were also encouraged to use positive phrases when talking about math with students. A list of positive phrases (see Appendix D)

was given to each parent to use with their children when discussing math. Parents were encouraged to tell their children that they had great confidence in their ability to learn and do math.

Students wrote and shared their own math problems so that they more fully internalized and enjoyed math problems that were presented in the writer's math class. The students helped each other work problems written by other math students and brainstormed and discussed the best method to solve them. Sharing real life problems written by a peer made the problems more interesting and fun to solve. Kurtz and Muller (1981) state that when students write and share their own word problems a positive attitude toward working word problems in math class develops.

The modeling of math skills and story problems was used to show students that parents and teachers need to think, rethink, do, redo, and, finally, compare the solution to the problem to see if it makes sense and if not, start the process all over again. Children need role models to follow throughout their lives so having a role model for math may very well be the best way to learn to do and to enjoy math. Students need to see that parents and teachers do not always attain the correct answer with their first try and that a certain amount of tenacity is needed to meet the challenge of

math skills and word problems. Hawkins (1987) states that positive math experiences take place when parents and teachers model math problems.

The writer developed a Math Enhancement Program to be used by the classroom teacher that blended with the county curriculum and helped students to develop a desire to learn math and be less anxious in the process.

Report of Action Taken

A detailed description of action taken by the writer will give a greater understanding of the Math Enhancement Program that was implemented. The steps that the writer took in implementing the program are numbered and placed in sequential order of implementation.

I. The writer chose the practicum observer.
   - A. The program was discussed with the observer.
   - B. The writer advised the observer that updates would be made on the practicum from its implementation to its conclusion.

II. Selection of participants for the program.
   - A. The students were chosen from the average math group; the group the writer was

was assigned to teach.

B. The students who were asked to join the program were those who did not finish assignments, never asked questions, appeared to be worried or negative about math, and/or stated a dislike for math.

C. The program was explained to the students and 10 of the 20 students who scored below 60% on the Math Inventory (see Appendix A) decided to participate in the program.

III. The parents of the potential participants were contacted.

A. The parents were asked to give permission for their children to participate in the program.

B. The program was explained to the parents and they were informed of their part.

1. Positive reinforcement was discussed.

2. Modeling of problems was discussed.

IV. The students selected for the program were given a presurvey, pretest, and pre Apprehension Survey (see Appendices B,C, and H).

V. The county math curriculum was studied and math games and centers were selected for

kinesthetic and tactual experiences.

A. The writer used manufactured games bought with the writer's yearly budget and checked out from the school media.

B. The writer made math activities.

1. Math activities were made by the writer's class. The math activity boards and playing pieces were covered with seal lamin to make them more durable.

2. An area was set up in the room to permanently display and keep games and activities.

3. A great number of games was collected and math activities made so that the math area would not become staid and boring to the participants.

IV. A problem solving center was set up by the writer.

A. The supplies placed in the problem center consisted of paper, cans filled with colored pens, cans filled with pencils, boxes of crayons, scissors, rulers, markers, menus, maps, airline schedules

newspapers and index cards.

B. A guide to writing word problems was written on poster board and posted in center. It stated prewrite, write, revise, and share. A note was added to remind students to place solutions to all problems on the reverse side of the folder.

C. A box covered in colorful contact paper with the title of "word problems" on it was placed in the center area to house word problems created.

D. Students who participated in the program were instructed in how to write a word problem.

1. Several sample word problems and answer keys were left in the center area that had been elicited from students in the program and dictated to the writer.

2. The writer was the editor of the word problems to insure that all word problems written were solvable.

3. The writer modeled how to be a

peer teacher for the word problems written.

VII. The writer met with the program observer prior to implementation of the program.

A. The writer explained the program in great detail.

B. The writer showed the observer the problem solving center and the games and activities center.

C. The date for implementation was set with the permission of the observer.

VIII. The program was implemented for three months.

A. The last 15 minutes of math class were used to have student work on Math Enhancements activities, such as games and writing and solving word problems.

B. Games and centers were changed according to the math being taught from the text.

C. The problem solving center was checked weekly to make sure students wrote one problem per week of the program.

D. Students worked in groups of two or three students while playing games and solving word problems.

E. Candy treats were given to students who

won math games. The treat was added to the program as a motivational technique to help students maintain their interest in the games and activities.

F. Students were surveyed each week to make sure a variation of games and word problems were being used.

G. A weekly log was kept on each of the participants in the program (see Appendix G) to evaluate the progress of of each student. The weekly log was used instead of using the midpoint attitude survey (see Appendix B).

IX. The culmination of the three-month program.

A. The final parent interviews were held. The parents were asked to give a written statement of how they felt their children succeeded in math due to the program including how their children now felt about math and math problems.

B. The postsurvey (see Appendix B), posttest (see Appendix C), and post Apprehension Survey (see Appendix H) were administered.

C. All results were compiled and evaluated for the final report.

Time Line

January - 1989

1. Discussed program with writer's observer.
2. Chose possible students to participate in the program.
3. Used observations and short interviews to choose possible participants.
4. Started ordering games and making activities for the activity center.

January - 1989 (last week)

1. Conferred with parents of possible participants.
2. Gave parents the handout dealing with positive phrases (see Appendix D) and discussed modeling math problems. If parents were unable to come to school a telephone conference took place and papers were mailed.
3. Students took a presurvey (see Appendix B).
4. Students took a pretest (see Appendix C).
5. Problem solving center was set up.
6. Activities center was set up.
7. Students were instructed on how to write their own word problems.
8. Participants were shown how to be peer teachers for their original word problems.

February-April - 1989

1. Implementation of the program for three months.
2. Pre and post evaluation of the program.
3. Weekly evaluation of the program was kept in a log for each participant (see Appendix G).

May - 1989

1. Final interview with parents either in person or by telephone.
2. Final interview with students including postsurvey (see Appendix B), posttest (see Appendix C), and post Apprehension Survey (see Appendix H).
3. Compiled and evaluated results.
4. Report completed.

CHAPTER V

RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Results

The results of any project are contingent on the action taken. The writer's practicum produced positive results for all participants. Each of the objectives listed in Chapter III is discussed in detail in the following section.

The first objective called for an increase in the number of problems completed on daily assignments until all problems assigned were completed each and every day by the end of the program. Daily assignments were not being completed during the first five weeks of the program as students continued in their old habits. Students were then asked daily, how many problems they completed and they slowly started to show a great deal of pride in finishing all work assigned to them. The assignments were not only being completed but handwriting and neatness, in general, improved

tremendously. All students met the objective by the end of the fifth week of the program as shown in Table 1 and all students continued to complete all assignments until the completion of the practicum. Just as not doing assignments seemed to be a bad habit, doing assignments became a good habit and something to be maintained by the participants of the practicum.

Table 1

Results of Weekly Problems Assigned/Weekly Problems Completed

		Students								
Problems	A	B	C	D	E	F	G	H	I	J
Week 1										
Assigned	265	----------								
Completed	265	255	256	255	265	260	255	255	260	257
Week 2										
Assigned	277	----------								
Completed	274	277	273	260	270	277	270	274	275	264
Week 3										
Assigned	108	----------								
Completed	108	106	106	105	105	108	106	106	105	106
Week 4										
Assigned	225	----------								
Completed	225	223	222	225	223	225	223	222	225	225
Week 5										
Assigned	205	----------								
Completed	205	205	205	205	205	205	205	205	205	205
Week 6										
Assigned	176	----------								
Completed	176	176	176	176	176	176	176	176	176	176

Table 1 continued

Results of Weekly Problems Assigned/Weekly Problems Completed

	Students									
Problems	A	B	C	D	E	F	G	H	I	J
Week 7										
Assigned	121	----------								
Completed	121	121	121	121	121	121	121	121	121	121
Week 8										
Assigned	196	----------								
Completed	196	196	196	196	196	196	196	196	196	196
Week 9										
Assigned	172	----------								
Completed	172	172	172	172	172	172	172	172	172	172
Week 10										
Assigned	133	----------								
Completed	133	133	133	133	133	133	133	133	133	133
Week 11										
Assigned	142	----------								
Completed	142	142	142	142	142	142	142	142	142	142
Week 12										
Assigned	102	----------								
Completed	102	102	102	102	102	102	102	102	102	142

The second objective called for an increase in the number of questions asked in math class by the end of the program by 10%. The writer kept a tally of the number of questions asked weekly by each student. The objective was an overwhelming success. The increase in the number of questions asked from week 1 to week 12 ranged from 33% to 400% as shown on Table 2.

Table 2

Results of Questions Asked Tally

	Weeks												
Students	1	2	3	4	5	6	7	8	9	10	11	12	Gain
A	0	0	1	3	5	5	4	5	5	4	4	4	400%
B	1	0	1	2	4	5	4	5	5	4	5	5	400%
C	3	2	3	5	5	4	5	5	5	4	5	4	33%
D	2	3	2	3	3	5	5	5	5	4	4	5	150%
E	1	2	2	3	3	3	3	3	3	2	3	3	200%
F	0	1	1	4	4	3	3	3	3	4	3	3	300%
G	0	1	2	3	3	3	4	2	2	3	3	3	300%
H	0	0	2	4	4	4	4	4	4	2	4	4	400%
I	1	2	2	2	3	5	5	5	5	3	3	3	200%
J	2	1	2	2	2	3	4	4	4	4	3	3	50%

The questions asked were always pertinent to the material being mastered. Each student asked at least two questions per week after the third week of the practicum. The students became active participants instead of passive participants in mathematics class.

The third objective stated that a lessening of mathematics apprehension would be demonstrated by a 20% improvement in 9 out of the 10 students in the program as measured by a pre and post Math Apprehension Survey (see Appendix H). Ten out of 10 of the students in the program were successful in meeting the objective as shown in Table 3.

Table 3

Results of Pre/Post Math Apprehension Survey

Student	Pretest	Posttest	Improvement
A	18	25	38%
B	22	27	22%
C	18	25	38%
D	22	27	22%
E	18	22	22%
F	22	27	22%
G	15	20	33%
H	20	25	25%
I	15	24	60%
J	21	27	28%

Note: Maximum score = 30

The improvement of the participants from the pretest to the posttest ranged from a gain of 22% to a high of 60%. The students demonstrated a positive attitude about mathematics while in class as well by saying positive statements about mathematics and appearing at ease while completing assignments given in class.

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E	18	22	22%
F	22	27	22%
G	15	20	33%
H	20	25	25%
I	15	24	60%
J	21	27	28%

Note: Maximum score = 30

The improvement of the participants from the pretest to the posttest ranged from a gain of 22% to a high of 60%. The students demonstrated a positive attitude about mathematics while in class as well by saying positive statements about mathematics and appearing at ease while completing assignments given in class.

The fourth objective stated that students would demonstrate improvement in math proficiency by at least 10% when given a pre and post Math Test (see Appendix C). All of the students in the program met the objective as demonstrated on Table 4.

Table 4

Results of Pre/Post Math Test

Student	Pretest	Posttest	Improvement
A	*40	*80	*40
B	50	70	20
C	30	80	50
D	50	80	30
E	60	80	20
F	50	80	30
G	50	90	40
H	40	80	40
I	50	90	40
J	40	90	50

*Percentage

All of the students not only met the criteria but gained an increase of 20% to 50% on the posttest above the percentage earned on the pretest within the three month time span of the practicum (see Table 4).

The fifth objective stated that when students were given a pre and post Attitude Survey (see Appendix B) each student would demonstrate a positive improvement in feelings about math class by 20%. As noted on Table 5, the objective was met by all of the students in the program.

Table 5

Results of Pre/Post Attitude Survey for Math Only

Student	Pretest	Posttest	Improvement
A	* 3	* 1	60%
B	2	1	20%
C	2	1	20%
D	4	3	20%
E	5	1	80%
F	4	3	20%
G	5	4	20%
H	3	2	20%
I	4	3	20%
J	3	1	40%

* 1 = best liked 2 = liked 3 = liked sometimes 4 = less liked 5 = least liked

Based on the measured objectives and the writer's observations throughout the practicum, students appeared to demonstrate a positiveness about math class and math in general.

Conclusion

All of the objectives of this practicum were fully achieved. The countywide mathematics curriculum was enhanced by the Math Enhancement Program. Students finished assignments, asked more questions, became less apprehensive about mathematics, attained higher grades on weekly tests as well as on a posttest as compared to a pretest, and demonstrated positive feelings about mathematics, in general, by the culmination of the three-month practicum implementation period. The participants in the Math Enhancement Program made significant gains in achievement and attitudes related to mathematics during this practicum.

The positive attitude of the writer as well as the participants' parents regarding mathematics helped students realize that mathematics is something that is in our daily lives and is to be enjoyed and used without apprehension.

Good (1981) stated that positive attitudes demonstrated by those important to students, such as parents and teachers, help students to develop positive attitudes about material being taught. As the writer as well as the participants' parents made a concious effort to use positive statements when discussing or dealing with mathematics, students started to develop

more positive feelings about mathematics. The positive feelings developed by the students helped the students develop a strong desire to work and complete all mathematics problems assigned to them. The writer and the parents of the participants in the Math Enhancement Program became true partners in the participants' education. The writer and the participants' parents no longer had to continually ask students where their daily assignment were, students were eager to do the work assigned. Doing assignments was "in"; not doing assignments was "out". Participants in the practicum became so diligent about having assignments completed that they would ask to call home to have assignments delivered to school when they were forgotten in the rush to get to the bus stop on time. The desire to complete assignments on time became a high priority for Math Enhancement participants with a relatively small amount of effort on the part of the writer in partnership with the participants' parents. The positive attitudes of the writer and participants' parents equaled positive results as demonstrated in the number of problems completed by the participants and the positive attitudes they developed while learning mathematics.

Tobias and Weissbrod (1980) stated that students need to be given encouragement in the form of positive

feedback so that they feel free to ask questions and feel confident to voluntarily give answers to questions posed about materials being learned. The writer can definitely agree with Tobias and Weissbrod. The participants in the practicum asked very few or no questions prior to the implementation of this practicum. As the writer and the parents of the participants in the practicum made concerted efforts to give positive feedback to answers given to mathematics problems, students who asked and voluntarily answered few or no questions before the program began, eagerly asked questions about material being taught and became willing participants in answering questions posed by the writer. As a result of the encouragement given by means of positive phrasing, participants gained enough confidence in themselves to inform the writer of mathematics concepts taught earlier in the year or even in earlier school years that were not understood at the time and never learned. Due to this opening up of the participants to the writer, mathematics became a subject to understand instead of to be avoided and worried about. The participants appeared to relax and mathematics class became more of a give and take time for the sharing of mathematics.

Slavin (1981) and Johnson (1981) stated that students need to be active participants in order to

better internalize subject matter being taught. The writer can certainly confirm the finding of Slavin and Johnson. When the students were able to write and solve their own original word problems they were able to more fully internalize the mathematics being taught to them. The writing and sharing of word problems made mathematics come to life for the participants. When the participants shared their knowledge of mathematics during the writing of word problems they quickly realized whether or not they truly understood the mathematics being learned or freely asked the other participants or the writer for assistance. As the participants became more actively involved in writing and sharing word problems they more fully internalized the mathematics being taught.

Slavin (1981) stated that achievement levels and attitudes improve when students work with each other in a noncompetitive situation in the classroom. The writer supports Slavin's conclusions. When the participants helped one another with word problems created by the participants and complete mathematics center activities they learned mathematics more easily and developed better attitudes as demonstrated by the results of the instruments used to evaluate the program.

Dunn and Dunn (1978) and Hodges (1978) stated that students need to be taught through their preferred learning channel to more fully internalize material being taught without becoming anxious during the learning process. The writer fully agrees with Dunn and Dunn and Hodges. When kinesthetic/tactual activities, such as manipulatives in the form of games and learning centers, were added to the usual visual and auditory teaching methods, participants in the practicum were more easily able to internalize mathematics concepts and at the same time developed more positive feelings about mathematics class. Many students commented that they never understood many of the mathematical concepts until they were playing games dealing with the specific mathematical concept. Students stated that they were actually having fun doing and learning mathematics.

The writer will continue the Math Enhancement Program for the remainder of the school year. The writer will include all of the students in the writer's mathematics class. The writer will continue the Math Enhancement Program during the next school year. Math games and center activities will be bought as well as made in order to meet all areas of the mathematics curriculum. The school media will be advised of appropriate games and manipulatives to include in

their orders to provide a greater variety of materials to the writer as well as other educators interested in this program in the school.

In conclusion, the writer would like to expand, refine, and share the practicum in order to reach as many mathematics teachers and students as possible.

Recommendations

The writer provides the following recommendations for those planning to use the Math Enhancement Program.

1. Be sure to use a positive mind set whenever discussing and teaching mathematics.
2. Try to make parents partners in giving positive feedback to the students when discussing mathematics. Make lists of positive phrases available to parents. Positive phrases lists can be included when report cards are sent home.
3. Make sure that mathematics games used are appropriate for the level of the students and the curriculum being taught. Games should be field tested on a small group of students. The input of the students could be used to change games for the best experiences for the students.

4. It is not necessary to buy expensive games. Games may be found in Media Centers, easily made, brought in by students, borrowed from other teachers and earned with bonus points from book clubs such as Troll Books.
5. Allow students to borrow games over the weekends or vacations so that they can share the joy of mathematics with siblings, friends, and parents.
6. Give realistic mathematics assignments so that students have a positive feeling about stopping work for the 15 minute period to complete Math Enhancement activities without feeling that they are overburdened with homework.
7. If possible, extend math class from the usual hour to 1 hour and 15 minutes so that students have more time devoted to games and manipulatives.
8. Have students solve and check one another's word problems and have them show each other where answers need to be corrected so that each student becomes more careful with word problems in the future.
9. The writer chose to give candy treats for games won but rewards such as stickers,

certificates, or even announcing the winners to the class and a celebration by the class of applause may be used.

10. Use this program to spice up math class and make mathematics come to life only if you are able to accept a noise level that may rise with the excitement of students using manipulatives and playing and winning at games.

Dissemination

The writer feels that in ending this practicum the Math Enhancement Program is only just beginning. Many of the educators at the writer's school as well as other schools that the writer has contact with have shown great interest in this practicum. The fifth grade teachers in the writer's school plan to implement the Math Enhancement Program during the next school year. Plans are already in motion to extend math class an additional 15 minutes daily and to devote the extra 15 minutes to purely Math Enhancement Activities.

The writer plans to conduct a school based inservice to introduce the ideas set forth in this practicum during the next school year. Teachers attending the inservice will be updated on how others

involved in the Math Enhancement Program are doing as well as being informed of any new ideas and changes that may benefit the participants at monthly sharing sessions.

The writer will house a copy of this practicum in the school Media Center as well as in the District Media Center so that a greater number of educators can make use of the practicum and its findings.

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APPENDIX A

MATH INVENTORY

Math Inventory Test

Fifth Grade

1.) Write the expanded form of 9,543. _____

2.) What number is 6,739 rounded to the nearest thousand? _____

3.) 435 - 158 = _____

4.) $54.83 - $37.28 = _____

5.) 7 x 8 = _____

6.) 67 ÷ 3 = _____

7.) 1/10 + 1/5 = _____

8.) $4.45 x 57 = _____

9.) 7.009 + 8.12 = _____

10.) Sue bought a pack of paper for 35¢ and a pencil for 15¢. How much change did she get from a dollar? _____

Name _____ Date _____

APPENDIX B

ATTITUDE SURVEY

Attitude Survey

Pre/Post (circle one)

Please list the following subjects in order of best liked to least liked: reading, spelling, math, science, social studies.

Best Liked - 1. _____

Liked - 2. _____

Liked Sometimes - 3. _____

Less Liked - 4. _____

Least Liked- 5. _____

Name: _____ Date: _____

APPENDIX C

MATH TEST PRE/POST

Math Test

Fifth Grade

Pre/post

1.) Write the expanded for of 67,983._____

2.) In what place is 8 in the number 854,193? _____

3.) 8084 - 1978 = _____

4.) $134.98 - $34.99 = _____

5.) 8 x 9 = _____

6.) 897 ÷ 9 = _____

7.) 1/6 + 3/24 = _____

8.) $76.90 x 45 = _____

9.) 1.009 + 1.9 + 2.42 = _____

10.) Jim bought a toy car for $2.98 and five boxes of candy for 30¢ each. How much change did he have from $10.00? _____

Name: _____ Date:_____

APPENDIX D

POSITIVE PHRASING
PARENT HANDOUT

Positive Phrasing

great!
terrific!
Terrrrrrrrrific!
wonderful!
beautiful!
splendid!
outstanding!
bravo!
wow!
marvelous!
remarkable!
exceptional!
extraordinary!
unique!
dynamic!
powerful!
clever!
excellent!

original
creative
ingenious
imaginative
inventive
skillful
expert
thoughtful
studious
conscientious
industrious
meticulous
accurate
exact
precise
fastidious
scrupulous
heartwarming

happy days!
excellent paper!
much better!
shows effort
good understanding
dynamic phrasing
careful observation
extraordinary ability!
lovely paper
fine thinking
good thought
nice style
great job!

good structure
legible report
nice work
nice handwriting, typing
neat work, handwriting, typing
accurate notes
good potential
surprising ending
fun writing
scary idea!
good point
clear thinking

Wow! You really did a job!
What an original idea!
You will be the next Einstein!
What an exciting adventure!
You really came up with an idea!
What an imagination!
And you were worried! Excellent!
I <u>like</u> that!
Most interesting story.
That is thoughtful of you.
You show great ambition!
Keep up the good work!
You relate well to the topic.
I am pleased!
I am proud of you!
You did the right thing.
Your participation is appreciated.

You are very talented.
You are thorough and efficient.
You work well with others.
You have a very positive attitude.
Attentive to detail.
Loved your choice of words!
You should be proud of this!
Fulfills all requirements!
Shows a lot of work.
Did this really happen?!
Penmanship award of the year!
You did a heavenly job.
You did a fine job.
Good work habits!
You are very dependable.
I am very pleased with test scores
You have good insight.

APPENDIX E

ASSIGNMENTS TALLY SHEET

Assignments

Tally Sheet

Student Name _____

Week	Number of Problems Assigned	Completed
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

APPENDIX F

QUESTIONS ASKED TALLY SHEET

Questions Asked

Tally Sheet

Student Name _____

Week
1
2
3
4
5
6
7
8
9
10
11
12

APPENDIX G

WEEKLY LOG

Weekly Log

Student Name _____

Week	Positive / Negative	Notes
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

APPENDIX H

MATH APPREHENSION SURVEY

Math Apprehension Survey

Student _____(Pre/Post)

1. I like attending math class.

never	sometimes	always
1	2	3

2. Math assignments are easy for me to understand.

never	sometimes	always
1	2	3

3. I enjoy doing math work.

never	sometimes	always
1	2	3

4. I can easily remember math facts.

never	sometimes	always
1	2	3

5. I like my teacher to call on me in math class.

never	sometimes	always
1	2	3

6. I feel comfortable when I have to ask for help in math class.

never	sometimes	always
1	2	3

7. Math is easy for me.

never	sometimes	always
1	2	3

8. I always know how to do my math work after attending math class.

never	sometimes	always
1	2	3

9. I practice math on my own.

never	sometimes	always
1	2	3

10. I know that I will do well in math class.

never	sometimes	always
1	2	3

Table 1 continued

Results of Weekly Problems Assigned/Weekly Problems Completed

		Students								
Problems	A	B	C	D	E	F	G	H	I	J
Week 7										
Assigned	121	---								
Completed	121	121	121	121	121	121	121	121	121	121
Week 8										
Assigned	196	---								
Completed	196	196	196	196	196	196	196	196	196	196
Week 9										
Assigned	172	---								
Completed	172	172	172	172	172	172	172	172	172	172
Week 10										
Assigned	133	---								
Completed	133	133	133	133	133	133	133	133	133	133
Week 11										
Assigned	142	---								
Completed	142	142	142	142	142	142	142	142	142	142
Week 12										
Assigned	102	---								
Completed	102	102	102	102	102	102	102	102	102	142

The second objective called for an increase in the number of questions asked in math class by the end of the program by 10%. The writer kept a tally of the number of questions asked weekly by each student. The objective was an overwhelming success. The increase in the number of questions asked from week 1 to week 12 ranged from 33% to 400% as shown on Table 2.

Table 2

Results of Questions Asked Tally

	Weeks												
Students	1	2	3	4	5	6	7	8	9	10	11	12	Gain
A	0	0	1	3	5	5	4	5	5	4	4	4	400%
B	1	0	1	2	4	5	4	5	5	4	5	5	400%
C	3	2	3	5	5	4	5	5	5	4	5	4	33%
D	2	3	2	3	3	5	5	5	5	4	4	5	150%
E	1	2	2	3	3	3	3	3	3	2	3	3	200%
F	0	1	1	4	4	3	3	3	3	4	3	3	300%
G	0	1	2	3	3	3	4	2	2	3	3	3	300%
H	0	0	2	4	4	4	4	4	4	2	4	4	400%
I	1	2	2	2	3	5	5	5	5	3	3	3	200%
J	2	1	2	2	2	3	4	4	4	4	3	3	50%

The questions asked were always pertinent to the material being mastered. Each student asked at least two questions per week after the third week of the practicum. The students became active participants instead of passive participants in mathematics class.

The third objective stated that a lessening of mathematics apprehension would be demonstrated by a 20% improvement in 9 out of the 10 students in the program as measured by a pre and post Math Apprehension Survey (see Appendix H). Ten out of 10 of the students in the program were successful in meeting the objective as shown in Table 3.

Table 3

Results of Pre/Post Math Apprehension Survey

Student	Pretest	Posttest	Improvement
A	18	25	38%
B	22	27	22%
C	18	25	38%
D	22	27	22%
E	18	22	22%
F	22	27	22%
G	15	20	33%
H	20	25	25%
I	15	24	60%
J	21	27	28%

Note: Maximum score = 30

The improvement of the participants from the pretest to the posttest ranged from a gain of 22% to a high of 60%. The students demonstrated a positive attitude about mathematics while in class as well by saying positive statements about mathematics and appearing at ease while completing assignments given in class.

The fourth objective stated that students would demonstrate improvement in math proficiency by at least 10% when given a pre and post Math Test (see Appendix C). All of the students in the program met the objective as demonstrated on Table 4.

Table 4

Results of Pre/Post Math Test

Student	Pretest	Posttest	Improvement
A	*40	*80	*40
B	50	70	20
C	30	80	50
D	50	80	30
E	60	80	20
F	50	80	30
G	50	90	40
H	40	80	40
I	50	90	40
J	40	90	50

*Percentage

All of the students not only met the criteria but gained an increase of 20% to 50% on the posttest above the percentage earned on the pretest within the three month time span of the practicum (see Table 4).

The fifth objective stated that when students were given a pre and post Attitude Survey (see Appendix B) each student would demonstrate a positive improvement in feelings about math class by 20%. As noted on Table 5, the objective was met by all of the students in the program.

Table 5

Results of Pre/Post Attitude Survey for Math Only

Student	Pretest	Posttest	Improvement
A	* 3	* 1	60%
B	2	1	20%
C	2	1	20%
D	4	3	20%
E	5	1	80%
F	4	3	20%
G	5	4	20%
H	3	2	20%
I	4	3	20%
J	3	1	40%

* 1 = best liked 2 = liked 3 = liked sometimes 4 = less liked 5 = least liked

Based on the measured objectives and the writer's observations throughout the practicum, students appeared to demonstrate a positiveness about math class and math in general.

Conclusion

All of the objectives of this practicum were fully achieved. The countywide mathematics curriculum was enhanced by the Math Enhancement Program. Students finished assignments, asked more questions, became less apprehensive about mathematics, attained higher grades on weekly tests as well as on a posttest as compared to a pretest, and demonstrated positive feelings about mathematics, in general, by the culmination of the three-month practicum implementation period. The participants in the Math Enhancement Program made significant gains in achievement and attitudes related to mathematics during this practicum.

The positive attitude of the writer as well as the participants' parents regarding mathematics helped students realize that mathematics is something that is in our daily lives and is to be enjoyed and used without apprehension.

Good (1981) stated tha positive attitudes demonstrated by those imporant to students, such as parents and teachers, help tudents to develop positive attitudes about material beng taught. As the writer as well as the participants parents made a concious effort to use positive statments when discussing or dealing with mathematics, sudents started to develop

more positive feelings about mathematics. The positive feelings developed by the students helped the students develop a strong desire to work and complete all mathematics problems assigned to them. The writer and the parents of the participants in the Math Enhancement Program became true partners in the participants' education. The writer and the participants' parents no longer had to continually ask students where their daily assignment were, students were eager to do the work assigned. Doing assignments was "in" not doing assignments was "out". Participants in the practicum became so diligent about having assignments completed that they would ask to call home to have assignments delivered to school when they were forgotten in the rush to get to the bus stop on time. The desire to complete assignments on time became a high priority for Math Enhancement participants with a relatively small amount of effort on the part of the writer in partnership with the participants' parents. The positive attitudes of the writer and participants' parents equaled positive results as demonstrated in the number of problems completed by the participants and the positive attitudes they developed while learning mathematics.

Tobias and Weissbrod (1980) stated that students need to be given encouragement in the form of positive

feedback so that they feel free to ask questions and feel confident to voluntarily give answers to questions posed about materials being learned. The writer can definitely agree with Tobias and Weissbrod. The participants in the practicum asked very few or no questions prior to the implementation of this practicum. As the writer and the parents of the participants in the practicum made concerted efforts to give positive feedback to answers given to mathematics problems, students who asked and voluntarily answered few or no questions before the program began, eagerly asked questions about material being taught and became willing participants in answering questions posed by the writer. As a result of the encouragement given by means of positive phrasing, participants gained enough confidence in themselves to inform the writer of mathematics concepts taught earlier in the year or even in earlier school years that were not understood at the time and never learned. Due to this opening up of the participants to the writer, mathematics became a subject to understand instead of to be avoided and worried about. The participants appeared to relax and mathematics class became more of a give and take time for the sharing of mathematics.

Slavin (1981) and Johnson (1981) stated that students need to be active participants in order to

better internalize subject matter being taught. The writer can certainly confirm the finding of Slavin and Johnson. When the students were able to write and solve their own original word problems they were able to more fully internalize the mathematics being taught to them. The writing and sharing of word problems made mathematics come to life for the participants. When the participants shared their knowledge of mathematic during the writing of word problems they quickly realized whether or not they truly understood the mathematics being learned or freely asked the other participants or the writer for assistance. As the participants became more actively involved in writing and sharing word problems they more fully internalized the mathematics being taught.

Slavin (1981) stated that achievement levels and attitudes improve when students work with each other in a noncompetitive situation in the classroom. The writer supports Slavin's conclusions. When the participants helped one another with word problems created by the participants and complete mathematics center activities they learned mathematics more easily and developed better attitudes as demonstrated by the results of the instruments used to evaluate the program.

Dunn and Dunn (1978) and Hodges (1978) stated that students need to be taught through their preferred learning channel to more fully internalize material being taught without becoming anxious during the learning process. The writer fully agrees with Dunn and Dunn and Hodges. When kinesthetic/tactual activities, such as manipulatives in the form of games and learning centers were added to the usual visual and auditory teaching methods, participants in the practicum were more easily able to internalize mathematics concepts and at the same time developed more positive feelings about mathematics class. Many students commented that they never understood many of the mathematical concepts until they were playing games dealing with the specific mathematical concept. Students stated that they were actually having fun doing and learning mathematics.

The writer will continue the Math Enhancement Program for the remainder of the school year. The writer will include all of the students in the writer's mathematics class. The writer will continue the Math Enhancement Program during the next school year. Math games and center activities will be bought as well as made in order to meet all areas of the mathematics curriculum. The school media will be advised of appropriate games and manipulatives to include in

their orders to provide a greater variety of materials to the writer as well as other educators interested in this program in the school.

In conclusion, the writer would like to expand, refine, and share the practicum in order to reach as many mathematics teachers and students as possible.

Recommendations

The writer provides the following recommendations for those planning to use the Math Enhancement Program.

1. Be sure to use a positive mind set whenever discussing and teaching mathematics.
2. Try to make parents partners in giving positive feedback to the students when discussing mathematics. Make lists of positive phrases available to parents. Positive phrases lists can be included when report cards are sent home.
3. Make sure that mathematics games used are appropriate for the level of the students and the curriculum being taught. Games should be field tested on a small group of students. The input of the students could be used to change games for the best experiences for the students.

4. It is not necessary to buy expensive games. Games may be found in Media Centers, easily made, brought in by students, borrowed from other teachers and earned with bonus points from book clubs such as Troll Books.
5. Allow students to borrow games over the weekends or vacations so that they can share the joy of mathematics with siblings, friends, and parents.
6. Give realistic mathematics assignments so that students have a positive feeling about stopping work for the 15 minute period to complete Math Enhancement activities without feeling that they are overburdened with homework.
7. If possible, extend math class from the usual hour to 1 hour and 15 minutes so that students have more time devoted to games and manipulatives.
8. Have students solve and check one another's word problems and have them show each other where answers need to be corrected so that each student becomes more careful with word problems in the future.
9. The writer chose to give candy treats for games won but rewards such as stickers,

certificates, or even announcing the winners to the class and a celebration by the class of applause may be used.

10. Use this program to spice up math class and make mathematics come to life only if you are able to accept a noise level that may rise with the excitement of students using manipulatives and playing and winning at games.

Dissemination

The writer feels that in ending this practicum the Math Enhancement Program is only just beginning. Many of the educators at the writer's school as well as other schools that the writer has contact with have shown great interest in this practicum. The fifth grade teachers in the writer's school plan to implement the Math Enhancement Program during the next school year. Plans are already in motion to extend math class an additional 15 minutes daily and to devote the extra 15 minutes to purely Math Enhancement Activities.

The writer plans to conduct a school based inservice to introduce the ideas set forth in this practicum during the next school year. Teachers attending the inservice will be updated on how others

involved in the Math Enhancement Program are doing as well as being informed of any new ideas and changes that may benefit the participants at monthly sharing sessions.

The writer will house a copy of this practicum in the school Media Center as well as in the District Media Center so that a greater number of educators can make use of the practicum and its findings.

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APPENDIX A

MATH INVENTORY

Math Inventory Test

Fifth Grade

1.) Write the expanded form of 9,543. _____

2.) What number is 6,739 rounded to the nearest thousand? _____

3.) 435 - 158 = _____

4.) $54.83 - $37.28 = _____

5.) 7 x 8 = _____

6.) 67 ÷ 3 = _____

7.) 1/10 + 1/5 = _____

8.) $4.45 x 57 = _____

9.) 7.009 + 8.12 = _____

10.) Sue bought a pack of paper for 35¢ and a pencil for 15¢. How much change did she get from a dollar? _____

Name _____ Date _____

APPENDIX B

ATTITUDE SURVEY

Attitude Survey

Pre/Post (circle one)

Please list the following subjects in order of best liked to least liked: reading, spelling, math, science, social studies.

Best Liked - 1. _____

Liked - 2. _____

Liked Sometimes - 3. _____

Less Liked - 4. _____

Least Liked- 5. _____

Name: _____ Date: _____

APPENDIX C

MATH TEST PRE/POST

Math Test

Fifth Grade

Pre/post

1.) Write the expanded for of 67,983._____

2.) In what place is 8 in the number 854,193? _____

3.) 8084 - 1978 = _____

4.) $134.98 - $34.99 = _____

5.) 8 x 9 = _____

6.) 897 ÷ 9 = _____

7.) 1/6 + 3/24 = _____

8.) $76.90 x 45 = _____

9.) 1.009 + 1.9 + 2.42 = _____

10.) Jim bought a toy car for $2.98 and five boxes of candy for 30¢ each. How much change did he have from $10.00? _____

Name: _____ Date:_____

APPENDIX D

POSITIVE PHRASING
PARENT HANDOUT

Positive Phrasing

great!
terrific!
Terrrrrrrrrific!
wonderful!
beautiful!
splendid!
outstanding!
bravo!
wow!
marvelous!
remarkable!
exceptional!
extraordinary!
unique!
dynamic!
powerful!
clever!
excellent!

happy days!
excellent paper!
much better!
shows effort
good understanding
dynamic phrasing
careful observation
extraordinary ability!
lovely paper
fine thinking
good thought
nice style
great job!

Wow! You really did a job!
What an original idea!
You will be the next Einstein!
What an exciting adventure!
You really came up with an idea!
What an imagination!
And you were worried! Excellent!
I <u>like</u> that!
Most interesting story.
That is thoughtful of you.
You show great ambition!
Keep up the good work!
You relate well to the topic.
I am pleased!
I am proud of you!
You did the right thing.
Your participation is appreciated.

original
creative
ingenious
imaginative
inventive
skillful
expert
thoughtful
studious
conscientious
industrious
meticulous
accurate
exact
precise
fastidious
scrupulous
heartwarming

good structure
legible report
nice work
nice handwriting, typing
neat work, handwriting, typing
accurate notes
good potential
surprising ending
fun writing
scary idea!
good point
clear thinking

You are very talented.
You are thorough and efficient.
You work well with others.
You have a very positive attitude.
Attentive to detail.
Loved your choice of words!
You should be proud of this!
Fulfills all requirements!
Shows a lot of work.
Did this really happen?!
Penmanship award of the year!
You did a heavenly job.
You did a fine job.
Good work habits!
You are very dependable.
I am very pleased with test scores
You have good insight.

APPENDIX E

ASSIGNMENTS TALLY SHEET

Assignments

Tally Sheet

Student Name _____

Week	Number of Problems Assigned	Completed
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

APPENDIX F

QUESTIONS ASKED TALLY SHEET

Questions Asked

Tally Sheet

Student Name _____

Week	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

APPENDIX G

WEEKLY LOG

Weekly Log

Student Name _____

Week	Positive / Negative	Notes
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

APPENDIX H

MATH APPREHENSION SURVEY

Math Apprehension Survey

Student _____(Pre/Post)

1. I like attending math class.

never	sometimes	always
1	2	3

2. Math assignments are easy for me to understand.

never	sometimes	always
1	2	3

3. I enjoy doing math work.

never	sometimes	always
1	2	3

4. I can easily remember math facts.

never	sometimes	always
1	2	3

5. I like my teacher to call on me in math class.

never	sometimes	always
1	2	3

6. I feel comfortable when I have to ask for help in math class.

never	sometimes	always
1	2	3

7. Math is easy for me.

never	sometimes	always
1	2	3

8. I always know how to do my math work after attending math class.

never	sometimes	always
1	2	3

9. I practice math on my own.

never	sometimes	always
1	2	3

10. I know that I will do well in math class.

never	sometimes	always
1	2	3